U.S. Department of Energy
Environmental Management Program

Waste and Nuclear Materials Disposition Update

EM Site Specific Advisory Board Chairs Meeting
April 2008

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EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

Discussion Topics

- EM Program ~ Waste Disposition Overview
- Waste and Material Streams ~ Disposition Updates
- DOE-EM Disposition Planning Tools
  - Updated LLW/MLLW data currently available!
- Status of the Greater-Than-Class C (GTCC) LLW Disposal EIS

EM Program – Disposition Overview

- EM provides complex-wide leadership in management and disposition of DOE waste streams
  - Corporate Boards exist for each major waste stream
  - Headquarters oversight and coordination increased in recent years

- Recent organizational changes in the Office of Regulatory Compliance (EM-10) improved integration of waste and excess nuclear material disposition efforts
  - EM's nuclear materials program activities were moved to Office of Regulatory Compliance (EM-10) in January 2008

- DOE's waste management policy remains unchanged
  - DOE's *Waste Management Programmatic Environmental Impact Statement* and Records of Decision are still valid

EM's waste and materials disposition scope is significant

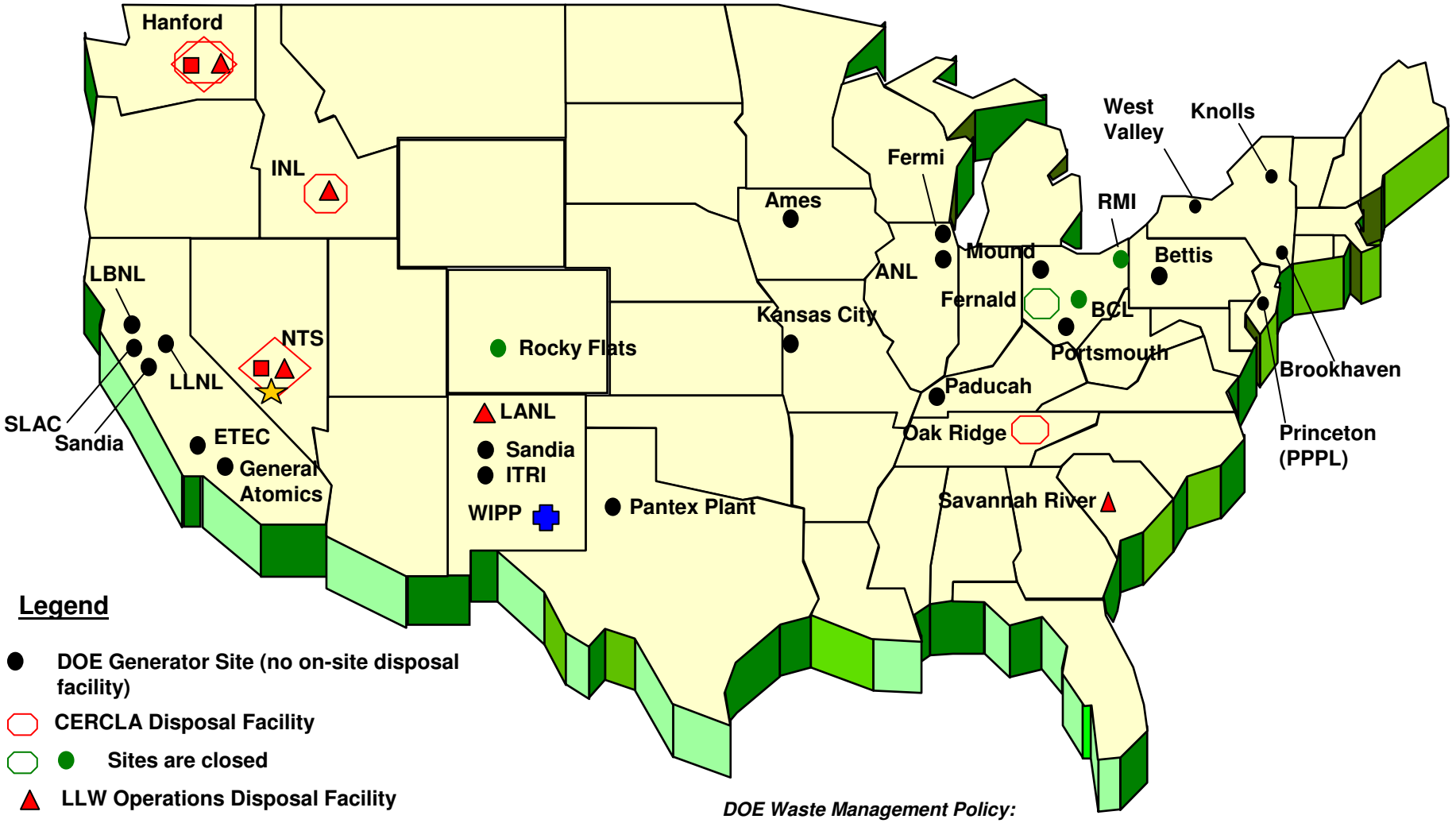
- Liquid tank waste (HLW and "low activity waste") and other HLW streams
  - 88 million gallons of liquid waste, stored in over 200 tanks
  - Also, calcined HLW and cesium and strontium capsules
  - Much of the disposition system is under design and construction
- Transuranic (TRU) waste
  - ~157,000 m^3 legacy wastes managed as TRU waste
  - Future TRU will be generated by DOE mission activities
- Low-Level Waste and Mixed Low-Level Waste (LLW/MLLW)
  - Majority of legacy wastes disposed – over 1 million m^3 disposed to date
  - DOE mission activities and EM cleanup generate LLW/MLLW wastes
- DOE owned and managed spent nuclear fuel (SNF)
  - ~ 2,500 metric tons of heavy metal stored at multiple sites
- EM managed surplus nuclear materials
  - ~12 metric tons of plutonium requiring disposition
  - ~700,000 metric tons of depleted uranium hexafluoride (cylinders) requiring conversion and possible disposal
  - Significant store of $uranium^{233}$ requiring down-blending, stabilization and disposal

DOE Order 435.1, Radioactive Waste Management, Establishes Policy & Framework for Waste Disposition Activities*

- HLW and SNF
  - Stabilization, immobilization/treatment if necessary, and safe interim site storage until geologic disposal is available
- TRU Waste
  - If defense, dispose at Waste Isolation Pilot Plant (WIPP)
  - If defense determination pending, safe storage awaiting future disposition
- LLW/MLLW
  - If practical, disposal on the site where generated
  - If on-site disposal not available, at another DOE disposal Facility
  - At commercial disposal facilities if compliant, cost effective, and in the best interest of DOE

* Other documents define plan for interim management of special nuclear materials (SNM); excess SNM disposal plans are integrated with waste plans

DOE's Complex ~ Waste Management View



Legend

- DOE Generator Site (no on-site disposal facility)
- CERCLA Disposal Facility
- Sites are closed
- LLW Operations Disposal Facility
- MLLW Operations Disposal Facility
- Regional LLW Disposal Facility
- Waste Isolation Pilot Plant (WIPP) for TRU disposal
- Yucca Mountain Repository for HLW/SNF Disposal

DOE Waste Management Policy:
LLW and MLLW: If practical, disposal on the site at which it is generated. If on-site disposal not available, at another DOE disposal facility. At commercial disposal facilities if compliant, cost effective, and in best interest of the Department
TRU waste: If defense, disposed at Waste Isolation Pilot Plant, New Mexico. If non-defense, safe storage awaiting future disposition
HLW and SNF: Stabilization, if necessary, and safe storage until geologic disposal is available

High-Level/Liquid Tank Waste Management ~ Program Overview

- Liquid waste management activities comprise nearly one third of the EM annual budget
  - Efforts span a wide range of activities, including: scientific analysis, design & engineering, R&D, technology development, tank farm operations, treatment facility construction, treatment and disposition operations
- Tank retrieval progress continues
- Implementation of "Section 3116" authorities continues at Idaho and Savannah River Site (SRS)
  - Allows residual waste (tank heels) to be left in place and managed to meet LLW requirements
  - Permits separated and treated low-activity waste to be disposed on site
  - Tank closures achieved at Idaho and SRS
- Facility construction continues
  - Waste Treatment Plant and related facilities at Hanford
  - Integrated Waste Treatment Unit at Idaho for Sodium Bearing Waste
  - Salt Waste Processing Facility at SRS
- Alternative evaluation and regulatory analysis underway for calcined HLW

High-Level/Liquid Tank Waste Management ~ Update

- HLW Corporate Board established; first meeting held April 1st
  - "The Board will identify need for and develop policies, planning, standards and guidance and provide the integration necessary to implement an effective and efficient national HLW program"
  - "The Board will also evaluate the implications of HLW issues and their potential impact across the complex and recommend solutions"
- Corporate issues:
  - Need to better document and understand tank inventory
  - Tank farm integrity, operability, life extension.
  - Effectiveness of different pre-treatment technologies
  - Tank residual goals – to be driven by performance assessment
  - Waste determination technical issues
  - Strategy for disposal of hazardous waste forms in repository
- Coordination with Office of Civilian Radioactive Waste Management continues to ensure DOE HLW adequately addressed in repository NEPA analyses and license application
- Actively reviewing and revising EM HLW-related standards and guidance to reflect new information, support current activities and align with repository requirements

TRU Waste Disposition ~ Program Overview

- National TRU Program, supported by a TRU Corporate Board, has been active since WIPP opened.
  - Safe, compliant and efficient disposal is an EM priority
  - Complex-wide strategy for optimized use of the WIPP facility and resources and disposition of legacy waste is being implemented
  - Continued refinements and efficiencies are targeted

- WIPP must be recertified by EPA every 5 years
  - First recertification approved in March 2006
  - Second recertification application under development for submission in March 2009

- Updated TRU inventory report (2007) recently published
  - http://www.wipp.energy.gov/library/Baseline2004/FINAL%20Annual%20TRU%20Waste%20Inventory%20Report-2007%20Main%20Body.pdf
  - Revised inventory is currently being incorporated into the Waste Information Management System (WIMS)

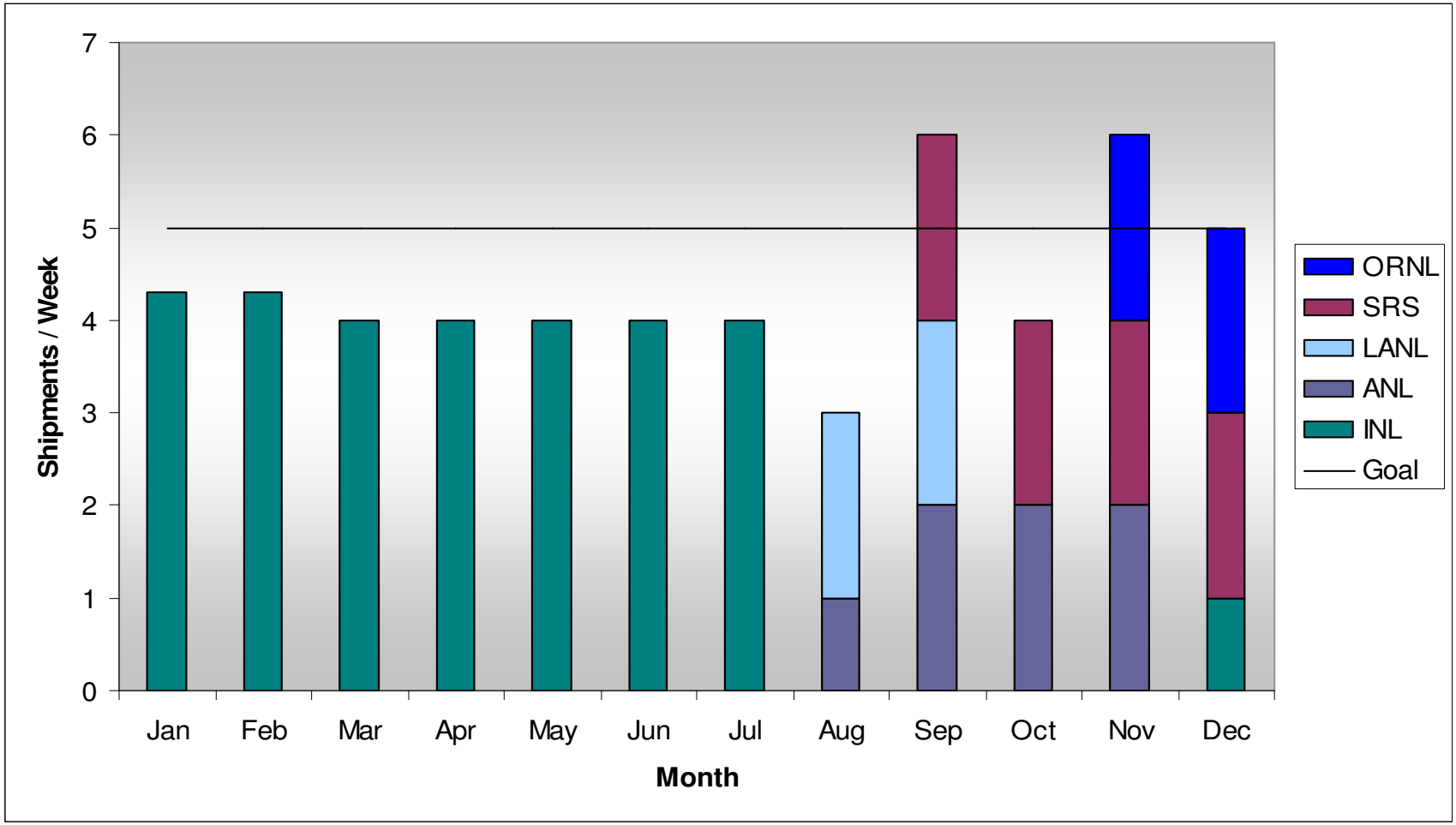
Transuranic (TRU) Waste ~ Disposition Update

- Waste Isolation Pilot Plant (WIPP) Summary
  - Over 54,000 m^3 of defense transuranic waste disposed
  - Completed over 6,600 shipments
- Remote-handled (RH) shipments began in January 2007
  - 134 RH shipments received to date at WIPP
- Removed legacy TRU waste from 13 sites; shipments from large generator sites continue
  - Some smaller sites' wastes were previously consolidated at large sites
  - DOE is currently planning for additional inter-site campaign
- EM strives to sustain an average of 21 contact-handled TRU (CH-TRU) and 5 remote-handled TRU (RH-TRU) shipments per week
  - Shipping rate is dependent on waste availability at generator sites
  - Annual shipping plan developed and maintained to retain complex's focus on fully utilizing the "TRU pipeline"

TRU Shipments Received – as of April 14th, 2008

Site	Shipments	Loaded Miles
Argonne National Laboratory	14	23.453
Idaho National Laboratory	2,801	3,897,600
Los Alamos National Laboratory	385	131,670
Lawrence Livermore National Laboratory	18	24,804
Nevada Test Site	48	57,312
Rocky Flats Environmental Technology Site	2,045	1,446,444
Hanford Site	400	723,200
Savannah River Site	896	1,379,840
Total to WIPP	6,607	7,684,323

Projected RH TRU Shipments



Shipments from LANL, SRS and ORNL dependent upon receipt of approval from NMED and/or EPA

TRU Waste Disposition ~ New Developments

- *DOE intends to send both CH and RH TRU waste to Idaho National Laboratory to be treated and characterized prior to shipment to WIPP for disposal.*
- DOE completed additional NEPA analysis and published an Amended Record of Decision (ROD) in Federal Register on March 7, 2008.
- Planning for inter-site shipment campaign is still underway currently underway; implementation details not yet available
  - However, DOE will continue to comply with the Idaho Settlement Agreement terms and milestones
- Approximately 2,067 CH-TRU shipments and 188 RH-TRU shipments could move to INL for treatment and characterization
- Approximately 795 shipments of CH TRU and 621 of RH TRU would then require transport to WIPP for disposal

Inter-site TRU Shipments to INL

- Shipment Sites:
  - Hanford Site (Richland, WA)
  - Nevada Test Site
  - Lawrence Berkeley National Laboratory (Berkeley, CA)
  - Lawrence Livermore National Laboratory (Livermore, CA)
  - GE Vallecitos Nuclear Center (Sunol, CA)
  - Argonne National Laboratory (Argonne, IL)
  - Knolls Atomic Power Laboratory (Schenectady, NY)
  - Separations Process Research Unit (SPRU) (Schenectady, NY)
  - Paducah Gaseous Diffusion Plant (Paducah, KY)
  - Knolls Atomic Power Laboratory (Nuclear Fuel Services) (Erwin, TN)
  - Bettis Atomic Power Laboratory (West Mifflin, PA)
  - Sandia National Laboratory (Albuquerque, NM)

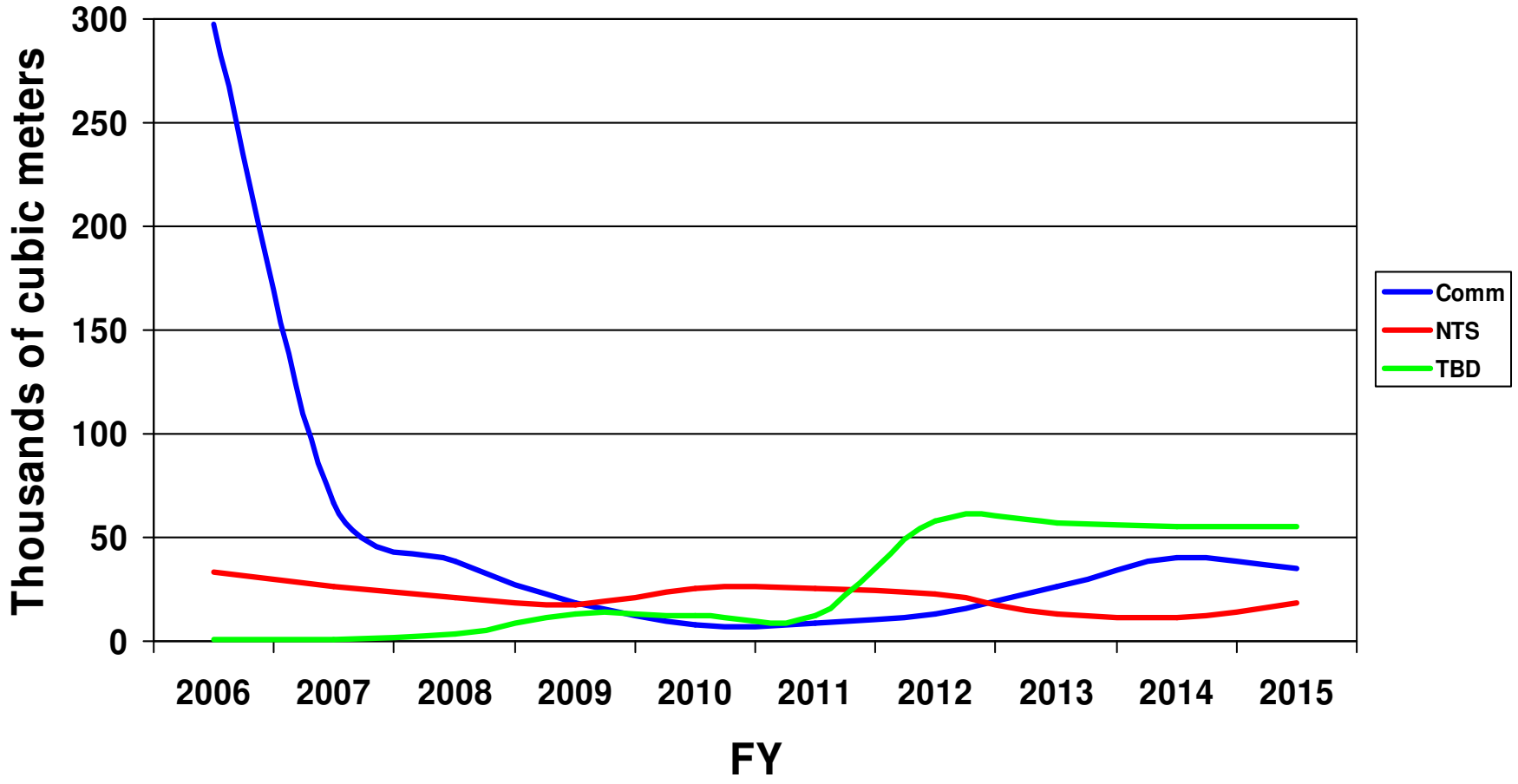
Low-Level/Mixed Low-Level Waste (LLW/MLLW) ~ Disposition Update

- Established DOE LLW Corporate Board
  - First meeting January 2008
  - Identified issues and topics for June 2008 meeting
  - Approved bylaws
- DOE-wide life-cycle waste forecasts collected
  - Waste Information Management System (FY 07 data) **http://wims.arc.fiu.edu/WIMS**
  - Development of more detailed disposition planning tools continues (Oak Ridge pilot)
    - Narrative summary of disposition plans
    - Disposition schedule
    - Risk mitigation plans

LLW/MLLW ~Trends

- On-site disposal continues at most sites
  - Expansion of some on-site facilities underway or planned
  - New on-site facilities under evaluation for future large D&D projects
- Volumes requiring off-site waste disposal continue to drop
  - Expect trend to continue due to DOE budget constraints.
- Retention of off-site disposal options is critical, as some streams require it
- Taking steps to optimize disposal operations at the Nevada Test Site (NTS)
  - EM direct funds single-shift disposal operations in FY 08
  - NTS forecasts are under configuration control and updated quarterly
- Commercial disposal continues to be cost effective alternative for many lower activity debris and soil streams

Volume of LLW/MLLW Disposed Offsite has Declined



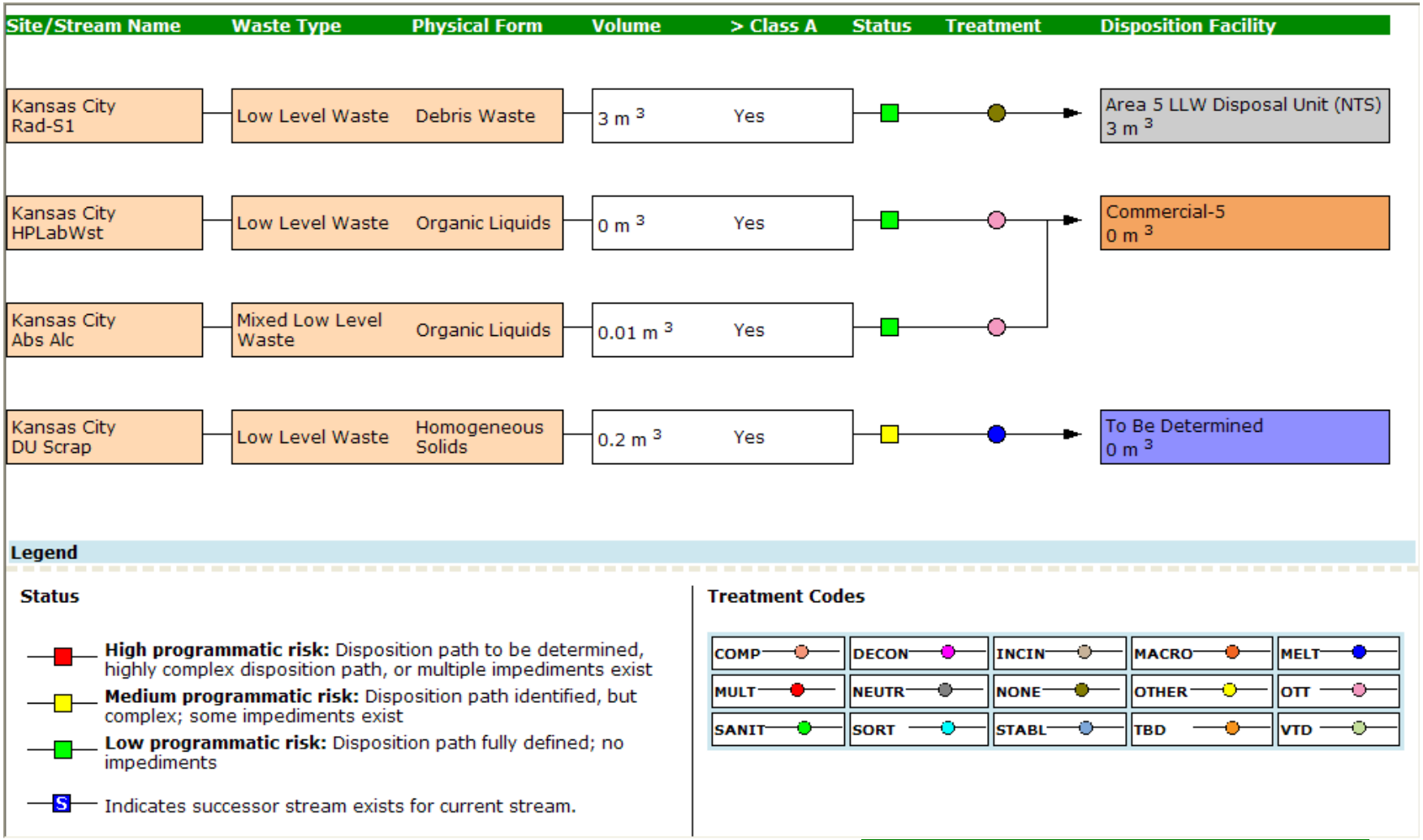
LLW/MLLW ~ Issues and Priorities

- Off-site waste shipments to Hanford remain suspended
  - Pending completion of the Hanford Tank Closure & Waste Management EIS and subsequent decisions
- DOE disposal capacity for MLLW (at NTS) ends in Nov 2010
  - Future alternatives are being evaluated, but remain uncertain
- Near term disposal plans will likely be constrained, and opportunities to optimize costs are critical to continued disposal progress
  - Increased emphasis of near term planning and cost-benefit analyses
  - Economies of scale are being sought
- Forecast volumes are somewhat uncertain
  - For example, some higher activity MLLW volumes "fall out" of TRU inventory

LLW/MLLW Treatment Update

- Toxic Substances Control Act Incinerator (TSCAI) at Oak Ridge continues to operate as DOE-wide treatment solution
  - TSCAI burned over 1.44 million lbs of waste in FY07
  - To date, TSCAI operated only a few weeks in FY08, due to extended outage for maintenance and repairs
- Life-cycle burn plan under HQs configuration control
  - Reflected operations thru FY09
  - Under revision currently to reflect outage and replan wastes that must be treated prior to closure in late FY09
- Market research and early acquisition planning underway to solicit commercial treatment services
  - Highlights need for thermal treatment – to "replace" TSCAI
  - Includes any treatment process needed to address remaining legacy and forecast generation

Our planning tools identify "problematic" wastes



EXAMPLE: Disposition Map

Presentation of Waste Forecast Data in WIMS: Shipments from Idaho National Laboratory

EXAMPLE: GIS Map

WIMS now includes transportation planning information

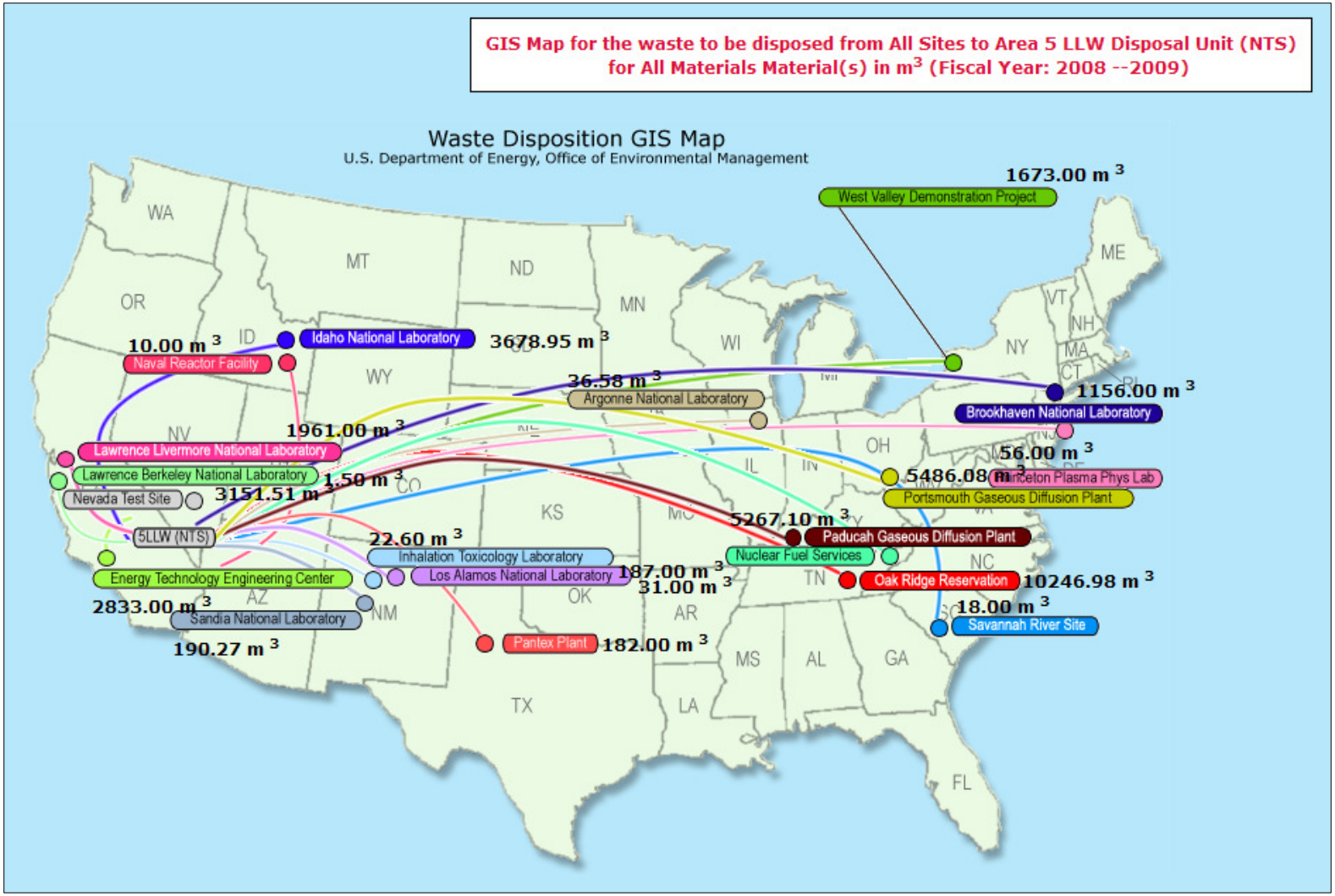
Shipping information for the Waste forecast to be disposed from All Sites to Area 5 LLW Disposal Unit (NTS)
for All Materials Material(s) (Fiscal Year: 2008 --2038 To 2050)

Row No	Reporting Site	Disposition Facility Name	Waste Stream Name	Field Stream ID	Waste Type	Rail 2008	Truck 2008	Intermodal 2008	Rail 2009	Truck 2009	Intermodal 2009	Row No
73	Portsmouth	Area 5 LLW Disposal Unit (NTS)	PORTS LLW RD-102_C	LLW03	Low Level Waste	0	0	288	0	0	0	73
74	Portsmouth	Area 5 LLW Disposal Unit (NTS)	PORTS LLW Small Cylinders	LLW SmallC	Low Level Waste	0	10	4	0	0	0	74
75	Portsmouth	Area 5 LLW Disposal Unit (NTS)	PORTS RCRA LLW X-770 Pad	PORTS RCRA	Low Level Waste	0	0	5	0	0	0	75
76	Portsmouth	Area 5 LLW Disposal Unit (NTS)	PORTS RCRA LLW Process Equipment (DMSA 11&12)	RCRA	Low Level Waste	0	0	0	0	28	0	76
77	Portsmouth	Area 5 LLW Disposal Unit (NTS)	PORTS LLW Depleted Uranium Metal	PORTS LLW	Low Level Waste	0	52	0	0	0	0	77

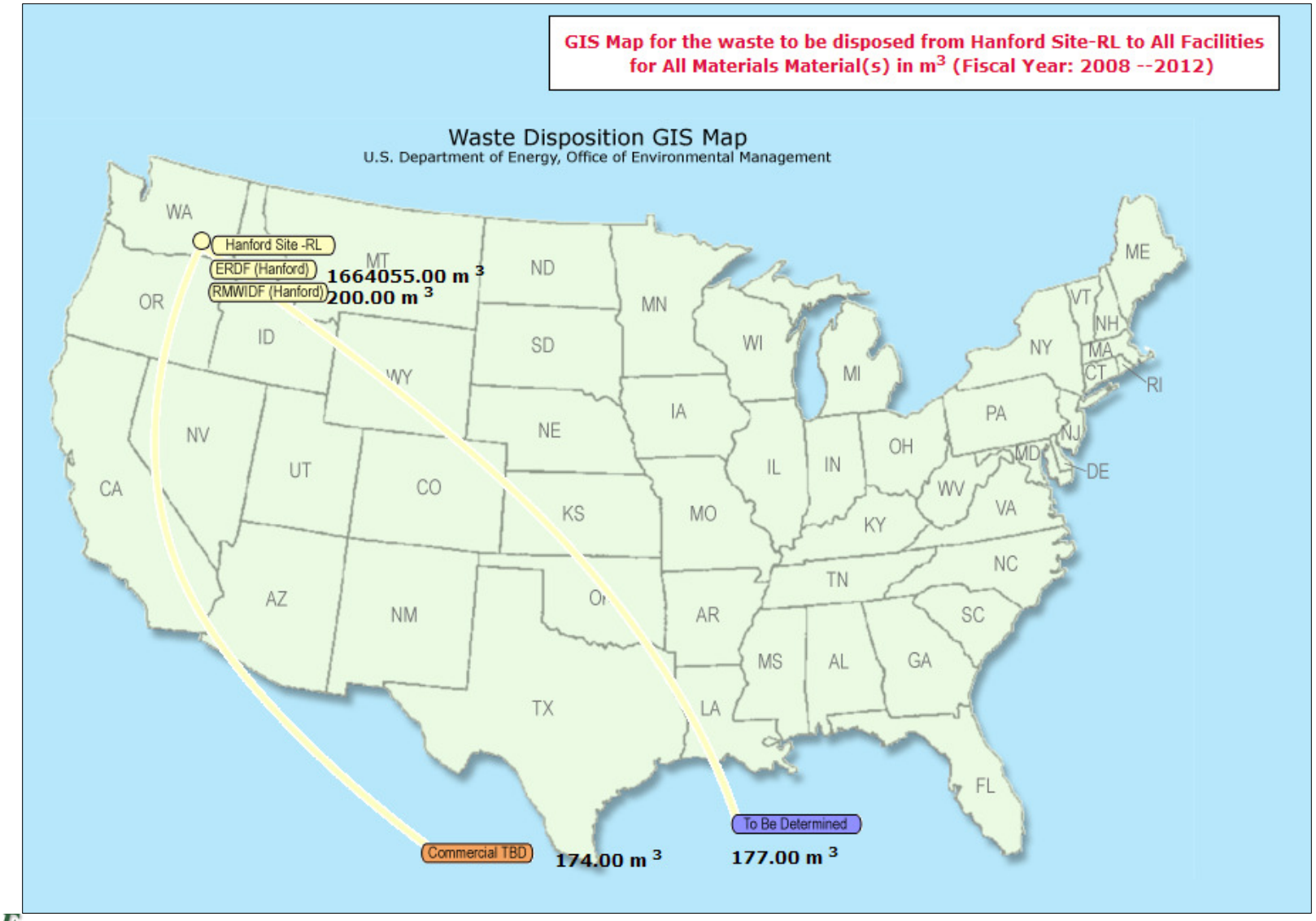
Reporting Sites AIL AEMP BAPL BCL ETEC FEMP HAMF-RL HAMF-RP KAPL LLWL LAWL MEMP NTS OPR PGDP PORT RFET SWLA

NEW!

Updated data: Projected LLW Shipments to NTS (and MLLW thru 2010)



Updated data: Hanford LLW/MLLW Disposition Summary



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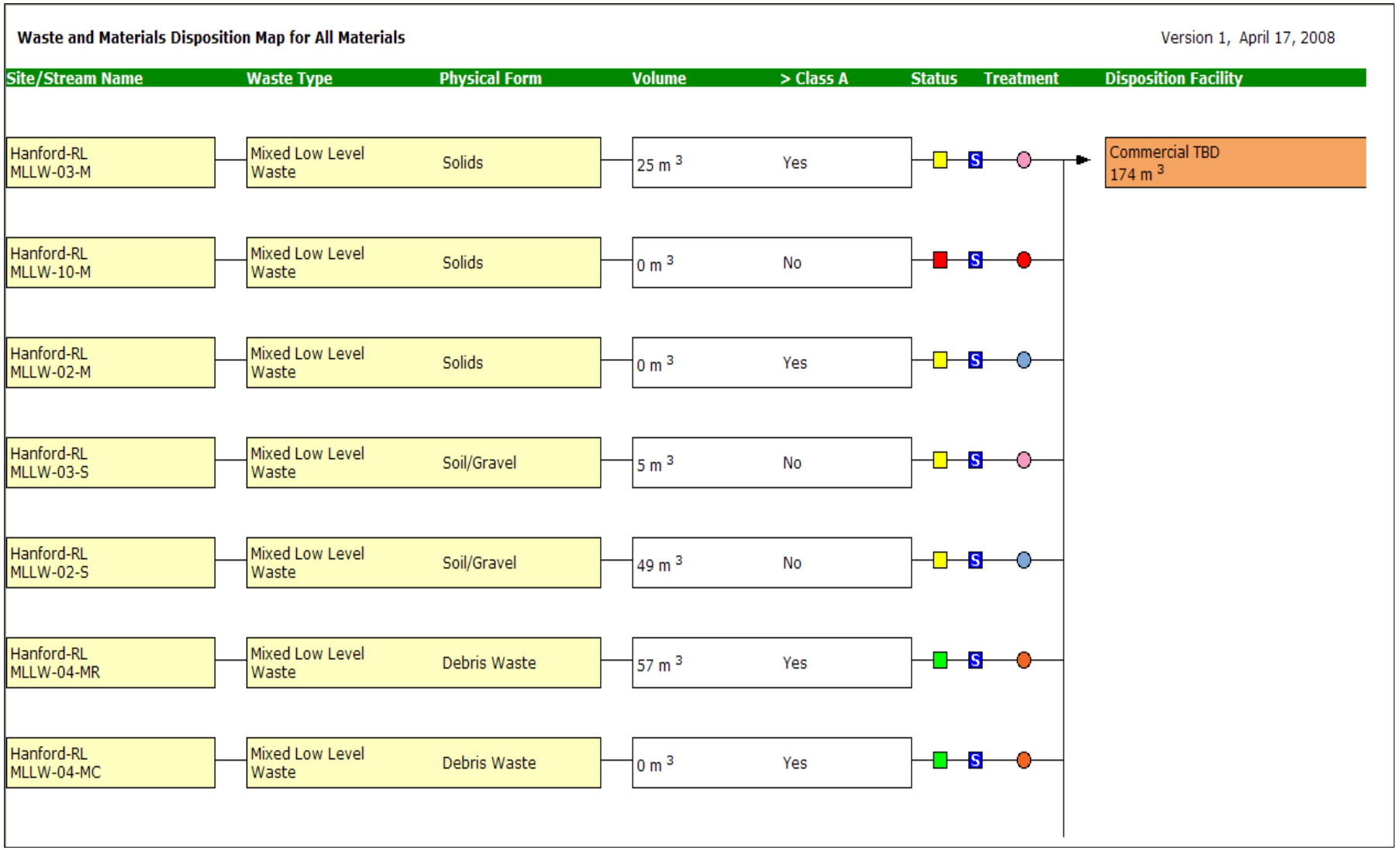

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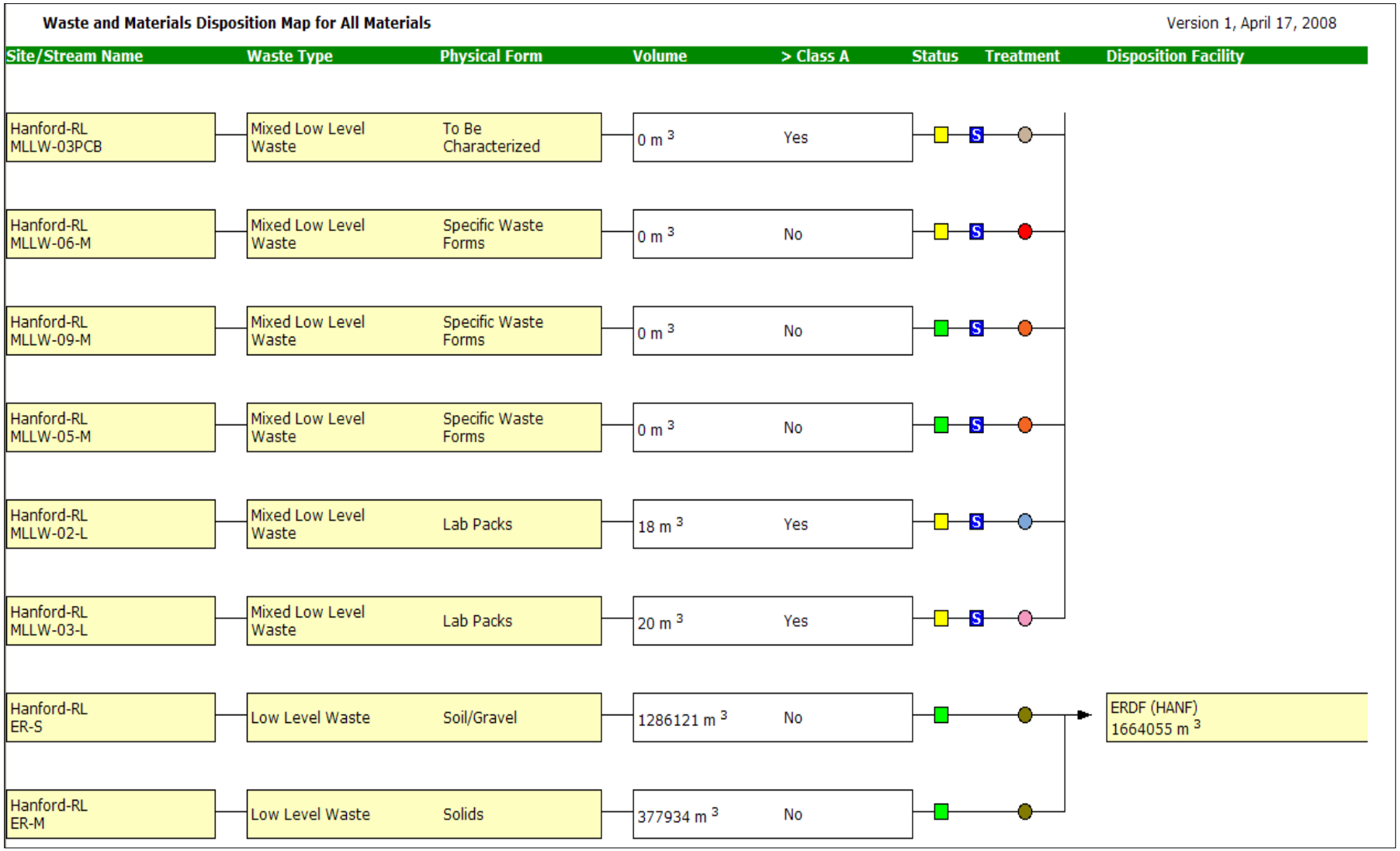

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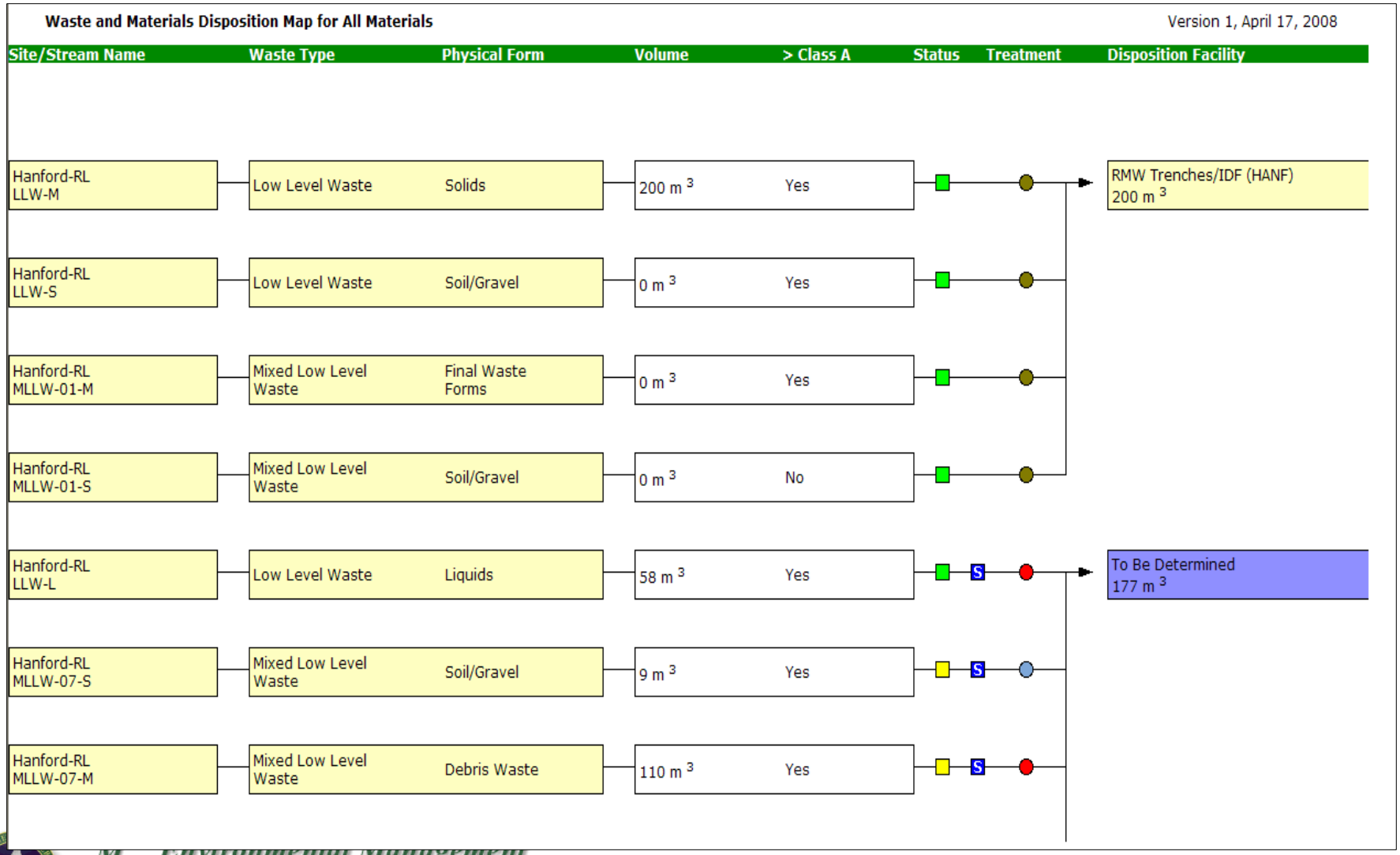

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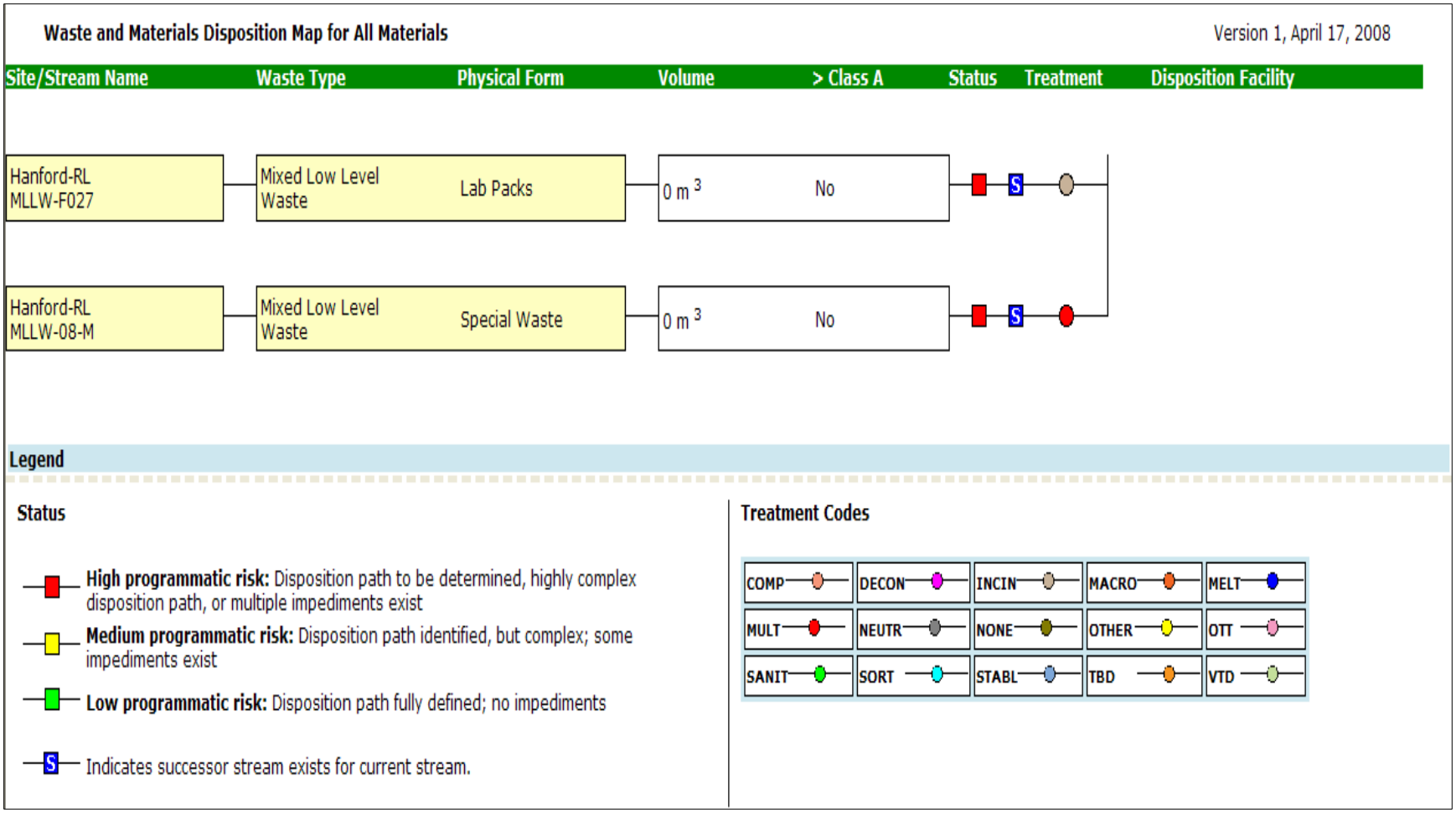


EM Spent Nuclear Fuel Management

- DOE manages about 2,500 MTHM of Spent Nuclear Fuel (SNF)
  - Most located at Hanford, Idaho, SRS
  - Idaho and SRS continue to receive SNF from domestic and foreign sources
    - Foreign Research Reactor program extended through 2019
- DOE plans to implement Enriched Uranium Disposition Project
  - SRS will process aluminum SNF in H-canyon (late 2009-2019)
  - Idaho will send aluminum SNF to SRS
  - SRS will send non-aluminum SNF to Idaho
  - SRS will not require a SNF packaging facility
  - 800 fewer SNF canisters would be sent to repository; increases HLW glass by about 150 canisters
  - Fuel swaps could start in 2009/2010 timeframe
- Sodium-bonded SNF is being consolidated at Idaho
- Hanford and Idaho requires SNF packaging facilities in future

Materials Disposition

- Efforts continue to ensure unneeded, surplus nuclear materials are prepared for disposition
- These plans are integrated with excess material disposition activities across DOE through the Nuclear Materials Disposition and Consolidation Coordination Committee (NMDCCC) and with waste disposal plans.
- Consolidation and disposition of surplus plutonium and highly enriched uranium continues.
- Construction of the DUF_6 conversion facilities continue
  - NEPA analysis for disposal sites underway
- U^{233}/Building 3019 Stabilization Project continues
  - Future processing will prepare U^{233} for permanent disposal
- EM supports Departmental efforts to ensure disposition for small volume material streams, as well

Greater-Than-Class C LLW Disposal

- The Low-Level Radioactive Waste Policy Act Amendments of 1985 assigned DOE the responsibility to identify disposal facility for GTCC LLW
  - The Energy Policy Act (EPAct) of 2005 required DOE to provide a report on the cost and schedule to develop an environmental impact statement (EIS) on GTCC LLW disposal
- EM has initiated EIS development efforts
  - Notice of Intent published in July 23, 2007
  - Public scoping process completed September 21, 2007
- DOE is evaluating disposal alternatives for commercially generated GTCC LLW, as well as DOE LLW and TRU waste with characteristics similar to GTCC LLW and which do not have an identified path to disposal
  - Original volumes estimates totaled 5,600 m^3
  - Inventory is being revised to include potential waste volumes from facilities and alternatives currently being evaluated in other DOE NEPA analyses

Proposed Alternatives in GTCC EIS

Alternative	Description
1	*No Action*—current and future GTCC LLRW and DOE GTCC-like waste would be stored at designated locations consistent with ongoing practices
2	*Disposal in a Geologic Repository at WIPP*—current and future GTCC LLRW and DOE GTCC-like waste would be disposed of at WIPP
3	*Disposal in a Geologic Repository at Yucca Mountain*—current and future GTCC LLRW and DOE GTCC-like waste would be disposed of at the proposed Yucca Mountain Repository
4	*Disposal at a New Enhanced Near Surface (ENS) Facility*—current and future GTCC LLRW and GTCC-like waste would be disposed of at a new ENS facility at INL, LANL, WIPP vicinity, NTS, SRS, ORR, or Hanford, or a commercial location
5	*Disposal at a New Intermediate Depth Borehole (IDB) Facility*—current and future GTCC LLRW and GTCC-like waste would be disposed of at a new IDB facility at the same locations identified in Alternative 4

Greater-Than-Class C (GTCC) LLW Disposal

- Over 250 comments received during scoping period
  - All will be evaluated
- Waste inventory is being revised, therefore most technical reports require revision
- DOE is interacting with Tribal governments to develop consultation strategy and incorporate activities within EIS schedule
- Draft EIS now targeted for early 2009; final EIS approximately one year later
- The EPAct of 2005 requires DOE to report to Congress on alternatives evaluated in EIS and await their action before issuing a Record of Decision.

Proposed Disposal Locations for EIS analysis

- WIPP, NM
- WIPP Vicinity, NM
- Proposed Yucca Mountain Repository, NV
- Idaho National Laboratory (INL), ID
- Los Alamos National Laboratory (LANL), NM
- Nevada Test Site (NTS), NV
- Savannah River Site (SRS), SC
- Oak Ridge Reservation (ORR), TN
- Hanford Site, WA
- EIS will also analyze generic commercial facilities

Questions?

Background slides

GTCC Inventory Estimates

- Total estimated stored and projected volume and activity of GTCC LLRW and DOE GTCC-like waste is approximately 5,600 cubic meters and 140 million curies (one cubic meter is about the volume of a bath tub)

GTCC LLRW

Total Volume = 2,600 cubic meters
Total Activity = 110 million curies

- Activated metals from nuclear utilities comprise 71% of the total activity of GTCC LLRW and GTCC-like waste
- Most of the activated metal waste is projected to be generated between 2035 and 2062

DOE GTCC-Like

Total Volume = 3,000 cubic meters
Total Activity = 31 million curies

- Approximately 2,600 cubic meters is TRU waste

This information reflects July 2007 NOI and is currently being reevaluated – volume will likely increase in response to public comments on inclusion of additional waste inventory

Deep Geologic Repository

- Placement of waste in mined cavities deep beneath the earth's surface
- This method is currently used for disposal of TRU waste at WIPP and is proposed for the disposal of spent nuclear fuel and high-level waste at the proposed Yucca Mountain Repository

Disposal of contact handled TRU waste in geologic repository

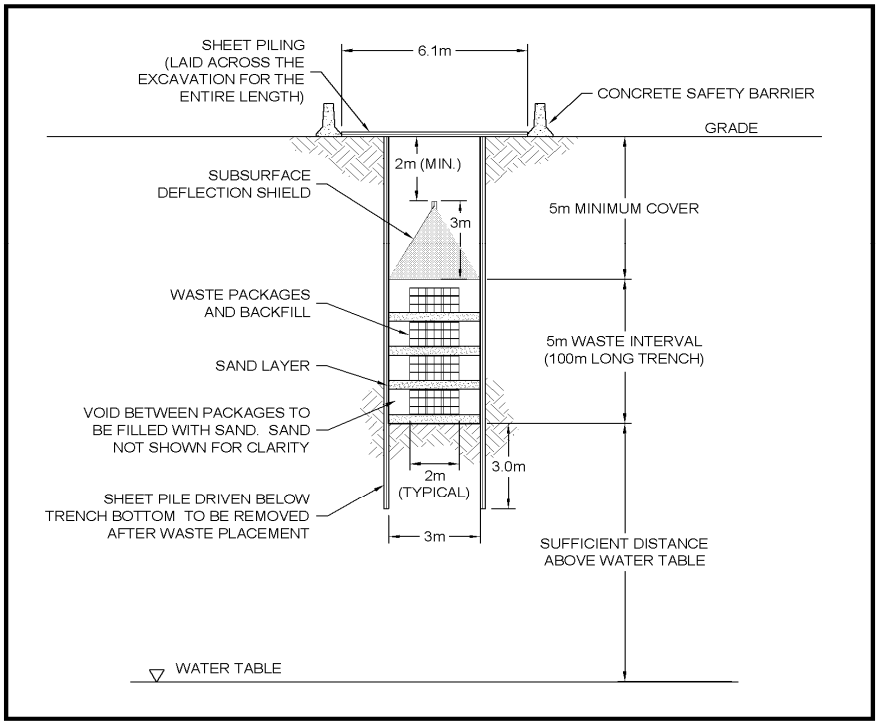
Enhanced Near Surface Disposal

- Placement of waste in engineered trenches, vaults, or other similar structures within the upper 30 meters of the earth's surface
- The containment characteristics of these facilities can be enhanced through barriers, deeper disposal, and waste packaging
- Two enhanced near surface technologies are currently being considered for the EIS analysis:
  - Trench
  - Above Grade Vault

Enhanced Near Surface Disposal

Trench Preliminary Conceptual Design

- Narrow and deep (3 m in width and 10 m in depth)
- Technology may not be applicable to all sites under consideration in the GTCC EIS (i.e., sites with shallow ground water)
- Additional features may be required for remote handled waste (e.g., a series of concrete culverts placed in the trench for worker protection during handling)

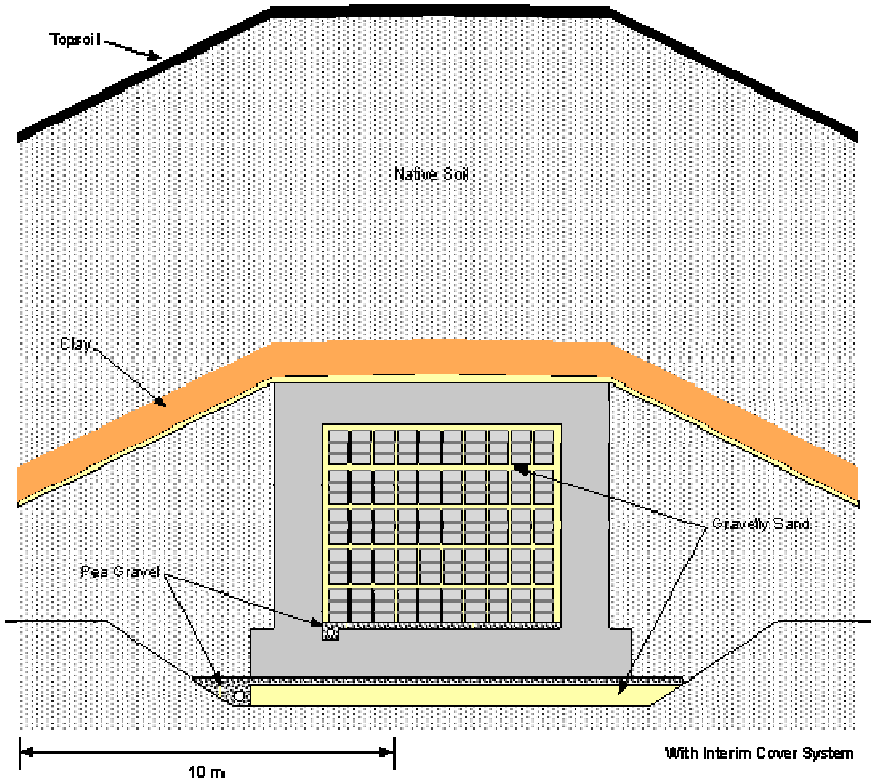


ENSD Trench Section

Enhanced Near Surface Disposal

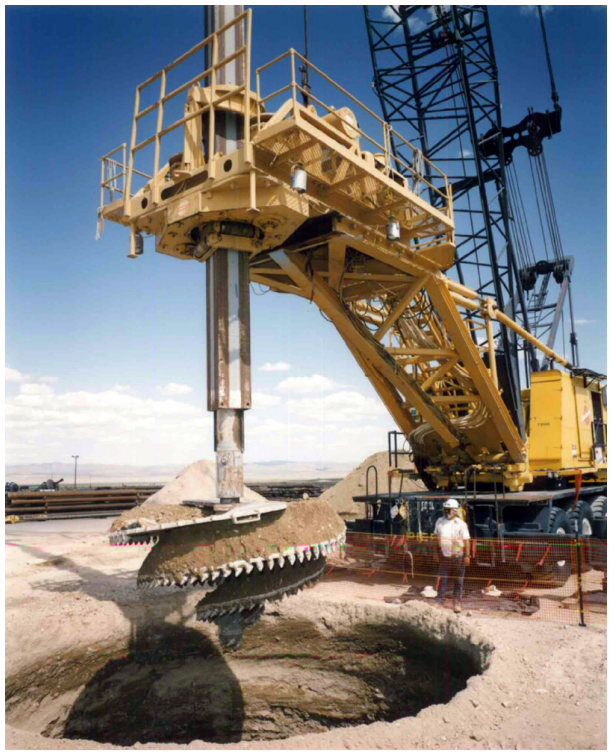
Above Grade Vault Preliminary Conceptual Design

- Reinforced concrete vault constructed near grade level
- Each vault would measure ~9 m wide, ~90 m long, and ~8 m tall
- Interior walls and roof would be constructed of reinforced concrete greater than 1-meter thick to provide shielding and protect against inadvertent intrusion
- Similar design used by DOE for disposal of higher activity low level waste streams



Intermediate Depth Borehole Disposal

- Placement of waste in an augered borehole deeper than 30 meters beneath the earth's surface
- Additional barriers such as drilling deflectors could provide increased protection against inadvertent human intrusion
- Successfully demonstrated in the U.S. and other countries



Close-up of drilling equipment for borehole construction